PATENT ABSTRACTS OF JAPAN

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(71)Applicant : RICOH CO LTD

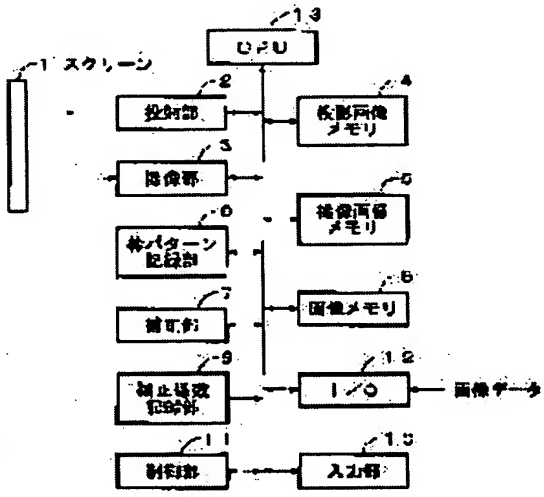
(72)Inventor : SAKURAI AKIRA

(54) PROJECTOR

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a projector that projects an image close to an original image onto its screen.

SOLUTION: The projector, that projects an image deployed in a projection image memory onto the screen via a projection section, is provided with an imaging section that is placed adjacent to the projection section and photographs and image on the screen to deploy the photographed image into an image pickup memory, and a correction section that identified an outer shape of the screen from the imaging memory and corrects the image to be deployed in the projection image memory, so that the image has the same outer shape as the identified outer shape.



LEGAL STATUS

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* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] Pro ZEEKUTA which discriminates the appearance of a screen from said image pick-up image memory from the image pick-up section which adjoins said projection area, is prepared in pro ZEEKUTA which projects the image developed by the projection image memory on a screen through a projection area, picturizes said screen, and develops to an image pick-up image memory, and is characterized by to have the amendment section which amends the image which develops to said projection image memory so that it may become the same appearance as the identified appearance.
[Claim 2] Pro ZEEKUTA according to claim 1 characterized by for a color differing from a reflection factor on said screen, having carried out trimming of the periphery, and preparing a frame.
[Claim 3] In pro ZEEKUTA which projects the image developed by the projection image memory on a screen through a projection area The image pick-up section which adjoins said projection area, is prepared, picturizes said screen, and is developed to an image pick-up image memory, The control section which makes the frame pattern corresponding to the frame of said screen project on said screen from said projection area, Pro ZEEKUTA which identifies a frame pattern from said image pick-up image memory, and is characterized by having the amendment section which amends the image developed to said projection image memory so that it may become the same form as the identified frame.
[Claim 4] Pro ZEEKUTA according to claim 3 characterized by said control section enabling it to change the frame pattern developed by said projection image memory so that the projected frame pattern may be projected on the predetermined location of said screen in a predetermined form by the input from the input section.
[Claim 5] Pro ZEEKUTA according to claim 3 or 4 characterized by performing amendment which divides said frame pattern in the shape of a mesh, and constitutes it, and said amendment section performs for each [which was divided in the shape of a mesh] rectangle frame of every.
[Claim 6] When the frame which constitutes said each rectangle is a broken line, it is pro ZEEKUTA according to claim 5 characterized by dividing and amending for every frame divided into two two in a break point location about a rectangle.
[Claim 7] It is pro ZEEKUTA according to claim 6 characterized by superimposing a parting line on said broken line location of the frame of the shape of said mesh projected, and making it project on it when judged with said frame being a broken line.
[Claim 8] Pro ZEEKUTA according to claim 1 to 7 characterized by picturizing the focal pattern which projected the focal pattern on said screen through said projection area, and was projected through said image pick-up section, and doubling the focus of said projection area and said image pick-up section by the image pick-up result.
[Claim 9] Pro ZEEKUTA according to claim 8 characterized by doubling a focus so that said focal pattern may compute MTF or contrast from the level of the focal pattern which the bar of white and black shall be repeated for every predetermined spacing, and was picturized and a calculation result may serve as max.

[Claim 10] Pro ZEEKUTA according to claim 8 or 9 characterized by arranging said focal pattern in a center or a center, and the four corners.
[Claim 11] The value with which said amendment section is equivalent to the difference in the scale factor of said projection area and said image pick-up section, pro ZEEKUTA according to claim 1 to 10 to which it is characterized by expanding or reducing and making it amend.
[Claim 12] Pro ZEEKUTA according to claim 1 to 11 characterized by generating a projection image using said correction factor currently recorded to the image with which said amendment section records the correction factor used for amendment, and is projected henceforth.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to pro ZEEKUTA which projects an image on a screen.
[0002]
[Description of the Prior Art] Pro ZEEKUTA which projects the image created by computer etc. on a screen is used widely by the end of today.
[0003]
[Problem(s) to be Solved by the Invention] In such conventional pro ZEEKUTA, if the subject-copy image A of the rectangle shown in drawing 10 (A) is projected from the direction of the lower left of a direction perpendicular to the core K of the screen B shown by drawing 10 (B), the transformed projection image as shown by C of drawing 10 (B) will be projected on Screen B.
[0004] For this reason, those who are looking at the screen produce sense of incongruity. This invention makes it a technical problem to offer pro ZEEKUTA on which the image projected on a screen was projected in the condition near a subject-copy image.
[0005]
[Means for Solving the Problem] Said projection area adjoins and it is prepared in pro ZEEKUTA which projects the image developed by the projection image memory on a screen through a projection area in invention of claim 1, and the appearance of a screen discriminates from said image pick-up image memory from the image pick-up section which picturizes said screen and is developed to an image pick-up image memory, and it has the amendment section which amends the image developed to said projection image memory so that it may become the same appearance as the identified appearance.
[0006] In invention of claim 2, a color differs from a reflection factor on said screen, trimming of the periphery is carried out, and a frame is prepared.
[0007] In pro ZEEKUTA which projects the image developed by the projection image memory on a screen through a projection area in invention of claim 3 The image pick-up section which adjoins said projection area, is prepared, picturizes said screen, and is developed to an image pick-up image memory, A frame pattern is discriminated from the control section which makes the frame pattern corresponding to the frame of said screen project on said screen from said projection area from said image pick-up image memory, and it has the amendment section which amends the image developed to said projection image memory so that it may become the same form as the identified frame.
[0008] It enables it to change the frame pattern developed by said projection image memory so that the frame pattern with which said control section was projected may be projected on the predetermined location of said screen in a predetermined form by the input from the input section in invention of claim 4.
[0009] In invention of claim 5, said frame pattern is divided in the shape of a mesh, and is constituted, and amendment which said amendment section performs is performed for each [which was divided in the shape of a mesh] rectangle frame of every. In invention of claim 6, when the frame which constitutes said each rectangle is a broken line, a rectangle is divided two in a break point location, and

it amends for every frame divided into two.
[0010] In invention of claim 7, when judged with said frame being a broken line, a parting line is superimposed and projected on said broken line location of the frame of the shape of said mesh projected. In invention of claim 8, the focal pattern which projected the focal pattern on said screen through said projection area, and was projected through said image pick-up section is picturized, and the focus of said projection area and said image pick-up section is doubled by the image pick-up result.
[0011] In invention of claim 9, said focal pattern computes MTF or contrast from the level of the focal pattern which the bar of white and black shall be repeated for every predetermined spacing, and was picturized, and a focus is doubled so that a calculation result may serve as max.
[0012] In invention of claim 10, said focal pattern is arranged in a center or a center, and the four corners. the value with which said amendment section is equivalent to the difference in the scale factor of said projection area and said image pick-up section in invention of claim 11 -- it expands or reduces.
[0013] In invention of claim 12, said amendment section records the correction factor used for amendment, and generates a projection image to the image projected henceforth using said correction factor currently recorded.
[0014]
[Embodiment of the Invention] The gestalt of operation of this invention is explained with reference to drawing 1 and drawing 2 . Drawing 1 is the block diagram of the example of this invention, and drawing 2 is the operation flow chart of the 1st example of this invention.
[0015] The image pick-up section in which a screen and 2 adjoined the projection area, 3 adjoined the projection area 2, and 1 was prepared in drawing 1 , The projection image memory which develops the image data which projects 4 on a screen 1 by the projection area 2, The image pick-up image memory which develops the image pick-up image data by which 5 was picturized in the image pick-up section 3, As for the image memory with which 6 records image data, and 7, the amendment section and 8 are the correction factor Records Department and a processor (CPU) to which in the frame pattern Records Department and 10 a control section and 12 perform an interface (I/O) and, as for 13, the input section and 11 perform [9] processing.
[0016] Below, before explaining actuation of the 1st example of this invention, the principle of this invention is explained with reference to drawing 3 . They are the subject-copy image of ****** with which drawing 3 (A) is recorded on the image memory 6, and the frame image of the screen 1 which drawing 3 (B) is picturized in the image pick-up section 3, and is developed by the image pick-up image memory 6.
[0017] That is, with regards to the location of the image pick-up section 3, the location on a screen 1, and distance, the picturized frame image becomes small as distance becomes long, and the frame of the rectangular screen 1 changes to the form shown by A, B, C, and D.
[0018] Moreover, supposing the scale factor of a projection area 2 and the image pick-up section 3 is the same, if the image of a line to which A, B, C, and D of drawing 3 (B) are connected is projected on a screen 1 from a projection area 2, the image of a line tied with A, B, C, and D is in agreement with the frame of a screen 1.
[0019] Therefore, the subject-copy image of drawing 3 (A) is reduced so that the four corners (a, b, c, d) of the frame of the subject-copy image shown in drawing 3 (A) may be in agreement with the four corners (A, B, C, D) of the frame image of drawing 3 (B). If it develops and projects on the projection image memory 4 as shown in drawing 3 (C), a subject-copy image and the image of the same form will be projected on a screen 1.
[0020] in addition, square Intersection K and the square intersection K which are shown in drawing 3 (B) in case a subject-copy image is developed to the projection image memory 4 of the diagonal line of A, B, C, and D -- the distance of A, B, C, and D -- max -- an image can be projected within the limit of a screen 1 by making a point in agreement with the angle to which the projection image memory 4 corresponds.
[0021] Below, the 1st example of this invention is explained with reference to drawing 2 . The image pick-up section 3 is ordered a control section 11, and it makes the screen image which picturized and

picturized the screen 1 record on the image pick-up image memory 5 at step S1. At step S2, the amendment section 7 computes a correction factor by extracting the frame image of the screen image currently recorded on the image pick-up image memory 5, and records it on the correction factor Records Department 8.
[0022] At step S3, the amendment section 7 amends the subject-copy image currently recorded on the image memory 6 based on the correction factor currently recorded on the correction factor Records Department 8, and develops it to the projection image memory 4.
[0023] Calculation of the correction factor in step S2 and amendment of the subject-copy image in step S3 are performed as follows, for example. The frame image which is a x-y coordinate and is shown by drawing 3 (B) in the subject-copy image shown in drawing 3 (A) is expressed with X-Y coordinate.
[0024] Moreover, a subject-copy image is divided into a number equal to the several n pixel which divides into a number equal to several m of ****** in the direction of y, and constitutes each ****** in the direction of y. In addition, what is necessary is just to decide beforehand m and the value n Becoming.
[0025] On the other hand, the coordinate value of the points A, B, C, and D of the four corners of the frame image shown by drawing 3 (B) is calculated. Line AB is explained henceforth. It asks for the location of X-Y coordinate when carrying out straight-line approximation of the n pixels on the line ab of a subject-copy image (a, b, c, d) on the line AB of a frame image (A, B, C, D).
[0026] (XA, YA), and Point B are expressed with (XB and YB) for the coordinate of Point A. The coordinates of (XA, YA), and a terminal point B of the coordinate of the starting point A of Line AB are (XB and YB).
[0027] Therefore, value XK of the X coordinate corresponding to the Kth pixel on the line ab of a subject-copy image XK =XA+K-(XB-XA)/n -- (1)
Moreover, value YK of Y coordinate YK =YA+K-(YB-YA)/n -- (2)
The becoming operation is performed and the location of X-Y coordinate is called for.
[0028] Moreover, coordinate value of X-Y coordinate corresponding to the starting point of ****** of the Jth original image (XJS, YJS) XJS=J-XA/m YJS=J-YA/m -- (3)
It comes out and asks and is a terminal coordinate value (XJE, YJE). XJE=XC+J-(XB-XC)/m YJE=YB+J-(YB-YC)/m -- (4)
It is come out and expressed.
[0029] Therefore, X-Y coordinate value of each pixel on the Jth ****** can be acquired by assigning the value of a formula (3) and the always point of (4) to a formula (1) and (2).
[0030] A correction factor is recorded on the correction factor Records Department 8. XC expressed with step S2 by the formula (3) and the formula (4), YB, (XB-XC)/m, and (YB-YC) /m -- At step S3, a point is always searched for by the formula (3) and the formula (4) from the subject-copy image to project, and a point location is substituted for a formula (1) and a formula (2) always which was called for, coordinate transformation is performed, and it develops to the projection image memory 4.
[0031] In addition, when the scale factors of a projection area 2 and the image pick-up section 3 differ, by amending the scale of part X-Y coordinate with which scale factors differ, a subject-copy image can be projected all over the frame of a screen 1.
[0032] Moving to step S4 following step S3, by step S4, a projection area 2 projects the projection image (amended subject-copy image) developed by the projection image memory 4 on a screen 1.
[0033] At step S5, when inputted, it moves to step S6, it judges whether projection termination [operator] was inputted, when there is an image projected on a degree, it moves to step S3, and steps S3-S6 are repeated.
[0034] In the example, it becomes conditions that the frame image shown by drawing 3 (B) is picturized clearly. Then, if a different color from a screen differs from a reflection factor, trimming of the edge of a screen 1 is carried out and a frame pattern enables it to picturize clearly, a frame image can be obtained easily.
[0035] Below, actuation of the 2nd example of this invention is explained with reference to drawing 4 . Although the screen 1 was picturized and the frame pattern had been obtained in the 1st example, in the

2nd example, from a projection area 2, a frame pattern is projected on a screen 1 and a frame pattern is obtained.

[0036] Steps S10-S16 of the 2nd example shown by drawing 4 are replaced with and added to step S1 of the 1st example explained by drawing 2 . At step S10, a control section 11 develops the frame pattern currently recorded on the frame pattern Records Department 9 to the projection image memory 4, and projects it on a screen 1 from a projection area 2.

[0037] As shown in drawing 5 , the focal pattern which the frame of the rectangle corresponding to the virtual frame of a subject-copy image, and the white for doubling a focus in a frame and a black bar repeat for every predetermined spacing superimposes the frame pattern on a center (drawing 5 (A)) or a center, and four corners (drawing 5 (B)).

[0038] At step S11, the frame pattern projected on the screen 1 through the image pick-up section 3 is picturized, and it develops to the image pick-up image memory 5. At step S12, the focal pattern developed by the image pick-up image memory 5 is extracted, and it judges whether it moves to step S13 and the focus is correct, when a judgment is NO, it moves to step S14, the focus of a projection area 2 and the image pick-up section 3 is adjusted, and it moves to step S11, and steps S11-S14 are repeated.

[0039] The judgment with the correct focus is performed as follows, for example. When the focus is correct, as shown in drawing 5 , the bar of white and black becomes clear, but it becomes not clear when the focus is not correct.

[0040] Then, level is measured in the direction which crosses a monochrome bar, and it is Pmin about Pmax and the minimum value in the maximum of level. If it carries out PC =(Pmax-Pmin)/ (Pmax+Pmin) -- (5)

The becoming operation is performed and it is PC. PC computed and computed From a predetermined value, if it is size, it will judge with the focus suiting.

[0041] Moreover, when level of W and black is set to B for white level, it is. MTF=(Pmax-Pmin)/(W-B) -- (6)

MTF is computed by performing the becoming operation, and from a predetermined value, if computed MTF is size, it will judge with the focus suiting.

[0042] Moreover, as shown in drawing 5 (B), when there is a focal pattern also in four corners, it is these five-piece PC. Or a focus is adjusted so that MTF may balance. When judged with the focus suiting at step S13, it moves to step S15, and the focal pattern developed by the projection image memory 4 is removed.

[0043] At step S16, actuation is added to the frame pattern developed by the projection image memory 4, and it is operated so that a frame pattern may become the target form in the location made into the purpose of a screen 1. That is, the frame pattern first developed by the projection image memory 4 is a rectangle shown by A, B, C, and D of drawing 6 (A).

[0044] If this rectangle (ABCD) is projected on a screen 1, it will become the square shown by A, B, C, and D of drawing 6 (B). Then, from the input section 10, an operator specifies Point A and inputs migration of Point A.

[0045] The input of migration is performed while an operator looks at the point A projected on the screen 1, and it moves so that Point A may become point A' made into the purpose on a screen 1. It moves to point B', point C', and point D' to Point B, Point C, and Point D similarly, and is made for the frame on a screen 1 to become a rectangle.

[0046] If the frame pattern developed by this projection image memory 4 is moved, after migration will serve as an amended frame pattern which is shown by A', B', C', and D'. The frame pattern shown by this A', B', C', and D' is moved to the image pick-up image memory 5. Step S2 of drawing 2 explained in the 1st example below is performed.

[0047] In addition, although it carried out in the example when the screen 1 was a flat surface, a wall etc. may be used as a screen, without using a plane screen. In this case, if the frame pattern which is rectangular ABCD is projected as shown in drawing 7 (B) when it is a curved surface, as the screen for which it substitutes shows drawing 7 (A), it will become the frame pattern shown by ABCD of drawing 7 (C).

[0048] When it becomes the frame pattern expressed with such a curve, it becomes impossible to use the formula (1) which could not express Line AB in a straight line, but mentioned it above - a formula (4). Therefore, when becoming such a curve, a frame pattern is made into the shape of a mesh as shown by drawing 7 (B). What is necessary is to attain straight-line approximation to the small rectangle divided by the mesh, and just to amend a subject-copy image with the application of a formula (1) - a formula (4) for every smallness rectangle by doing in this way.
[0049] moreover, a wall -- bending -- **** -- when it is and a mesh-like frame pattern is projected, it is crooked like drawing 8 (A). In such a case, what is necessary is just to process by dividing into two in a folding point, as shown in drawing 8 (B).
[0050] Moreover, looking at the projected frame pattern, a straight line is put into a folding point and you may make it divide, as shown in drawing 9 . Moreover, a convolution or pattern match INGU with the mask corresponding to an intersection or a folding point can extract easily the extract of the intersection of the mesh of a frame pattern, or a folding point.
[0051]
[Effect of the Invention] Since according to this invention the subject-copy image was amended so that the image which projected the frame pattern corresponding to an offscreen form or an appearance might be picturized, the frame of a screen might be obtained and it might become the same form as the obtained frame, the image projected on a screen will be in the condition near a subject-copy image, and will be projected.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the block diagram of the example of this invention.
[Drawing 2] It is the operation flow chart of the 1st example of this invention.
[Drawing 3] It is drawing for explaining the principle of this invention.
[Drawing 4] It is the operation flow chart of the 2nd example of this invention.
[Drawing 5] It is the example of a focal pattern.
[Drawing 6] It is drawing for explaining the 2nd example.
[Drawing 7] It is a mesh-like frame pattern.
[Drawing 8] It is drawing for explaining the frame pattern and processing in which it was projected in case a screen was as bending.
[Drawing 9] It is the frame pattern applied when a screen is as bending.
[Drawing 10] It is drawing for explaining the conventional example.
[Description of Notations]
1 Screen
2 Projection Area
3 Image Pick-up Section
4 Projection Image Memory
5 Image Pick-up Image Memory
6 Image Memory
7 Amendment Section
8 Correction Factor Records Department
9 Frame Pattern Records Department
10 Input Section
11 Control Section
12 Interface (I/O)
13 Processor (CPU)

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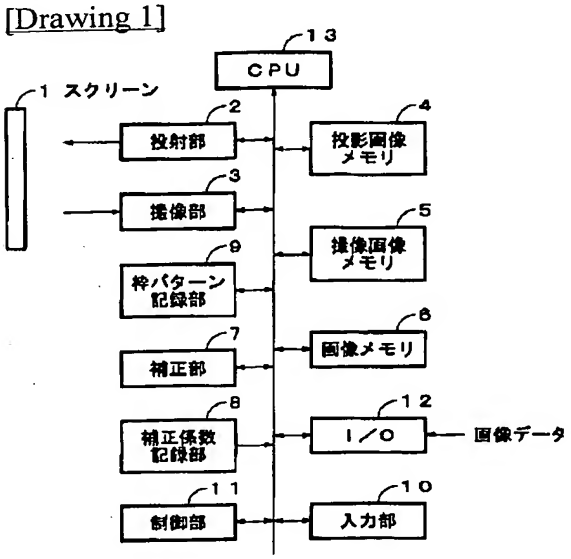
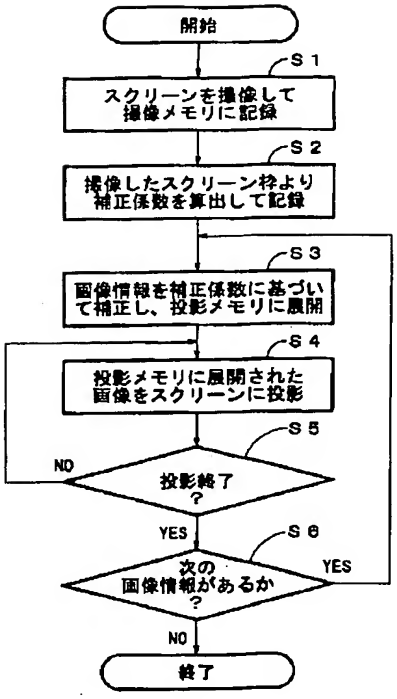
DRAWINGS

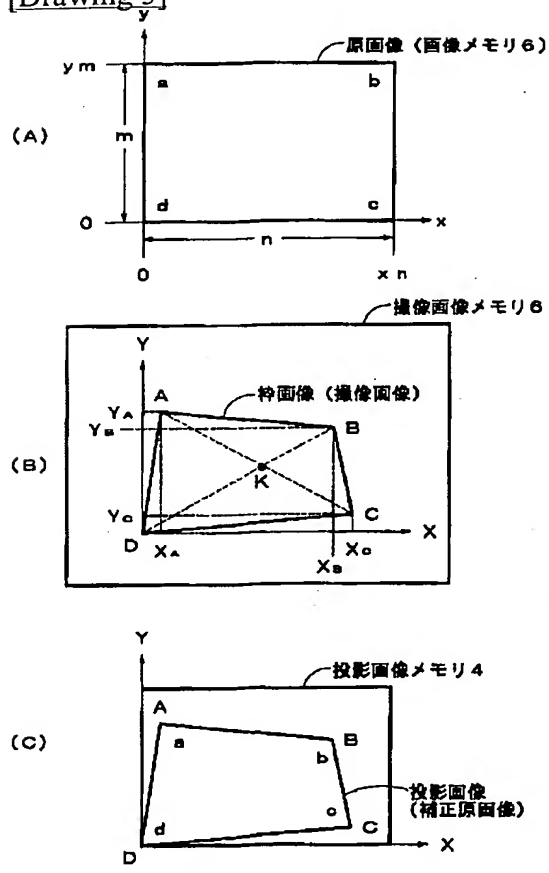
[Drawing 1]



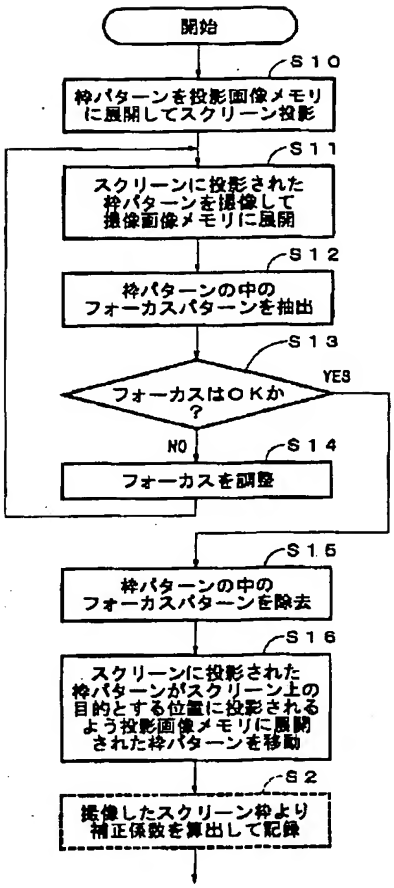
[Drawing 2]



[Drawing 3]



[Drawing 4]



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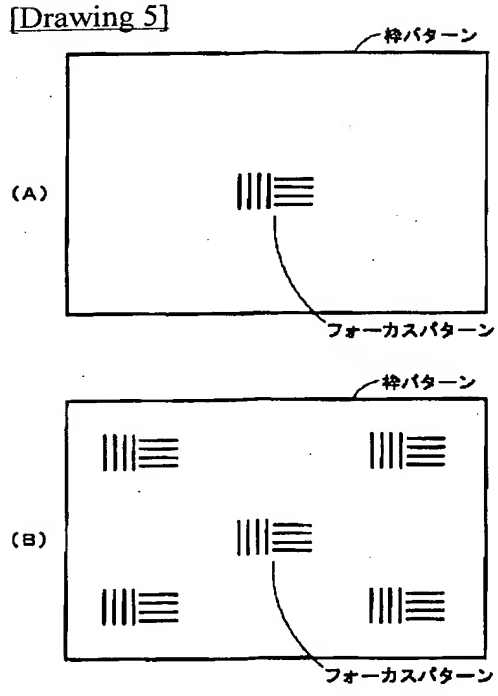

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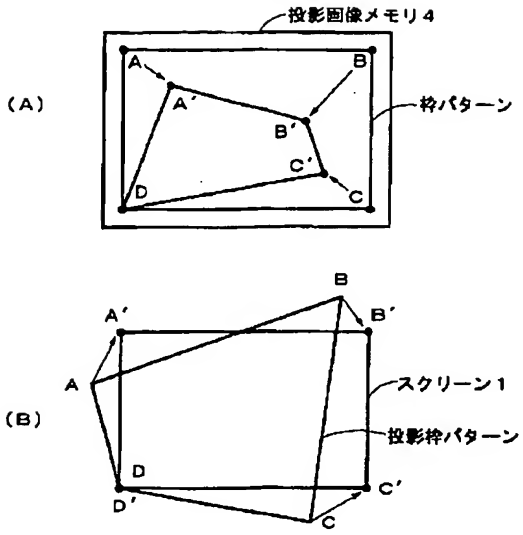

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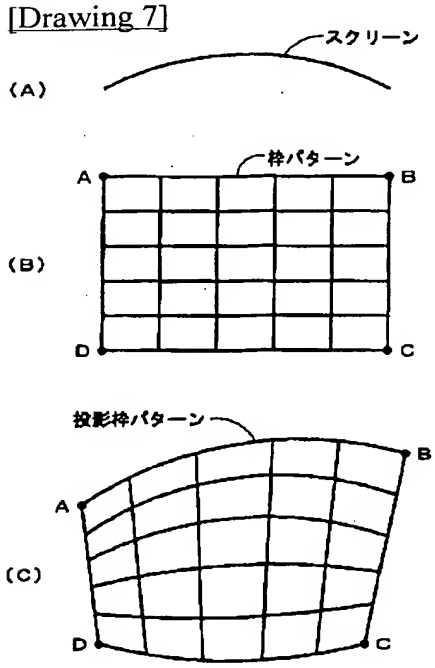
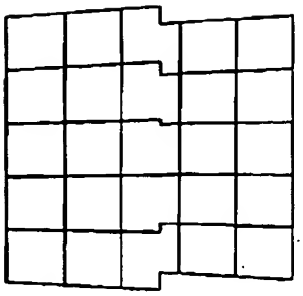


[Drawing 8]

(A)



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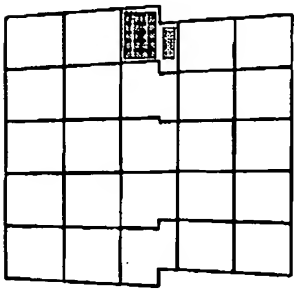
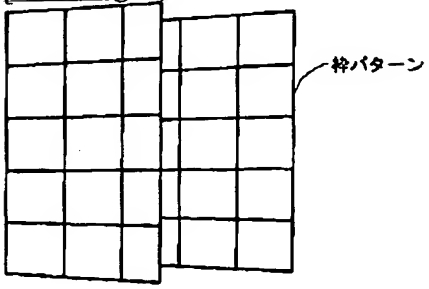
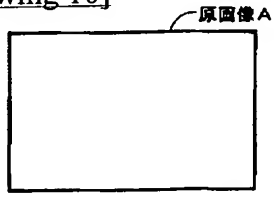


[Drawing 9]



[Drawing 10]

(A)



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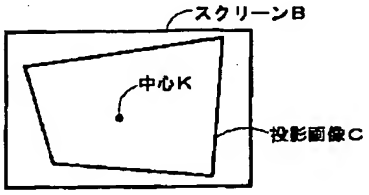

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